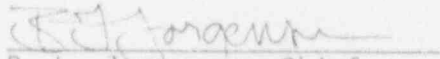


U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report Number: 50-295/304-94013(DRP) EA 94-079
Docket Numbers: 50-295; 50-304
License Numbers: DPR-39; DPR-48
Licensee: Commonwealth Edison Company
Opus West III
1400 Opus Place - Suite 300
Downers Grove, IL 60515
Meeting Conducted: May 11, 1994
Meeting Location: Region III Office
801 Warrenville Road
Lisle, Illinois 60532-4351
Type of Meeting: Enforcement Conference
Inspection Conducted: Zion Nuclear Generating Station
March 24, 1994 through April 26, 1994
Inspectors: J. D. Smith
M. J. Miller
V. P. Loughheed
Approved By: 
B. L. Jorgensen, Chief
Reactor Projects Section IA
Date 5-18-94

Meeting Summary

Enforcement Conference on May 11, 1994 (Report No. 50-295/304/94013(DRP))
Areas Discussed: Four apparent violations, identified in special inspection report 295/304-94010, were discussed, along with the corrective actions taken or planned by the licensee. The apparent violations involved (1) low flow rates through the high-head safety injection throttle valves, (2) the missed limiting condition for operation action requirements when two trains of auxiliary feedwater were inoperable, (3) the inadvertent capping of all four containment pressure sensing lines, and (4) the inoperability of the high-head safety injection suction valves due to lifted electrical leads.

DETAILS

1. Persons Present at Conference

Commonwealth Edison Company (CECo)

K. Strahm, Vice President, Pressurized Water Reactor Operation
R. Tuetken, Site Vice President
A. Broccolo, Station Manager
D. Bump, Maintenance Staff Supervisor
T. Cook, Mechanical Maintenance Master
R. Cooper, Electrical Maintenance
W. Demo, Electrical Maintenance Master
K. Depperschmidt, Instrument Maintenance Master
K. Dickerson, Regulatory Assurance Compliance Engineer
G. Grabins, Work Control Center Supervisor
K. Hansing, Site Quality Verification Director
R. Huber, Mechanical Maintenance
J. January, Electrical Maintenance
S. Kaplan, Regulatory Assurance Supervisor
W. Kurth, Long Range Work Control Superintendent
J. Madden, Assistant System Engineering Supervisor
D. Main, Unit Supervisor
H. Neale, Instrument Maintenance
L. Oberembt, Shift Engineer
T. O'Connor, Safety Analysis Engineer, Nuclear Fuels Services
A. Orawiec, Nuclear Station Operator
T. Poindexter, Attorney, Winston & Strawn
G. Ponce, Quality Control Supervisor
T. Printz, Assistant Superintendent of Operations
K. Ramsden, Reactor Systems Engineer
L. Simon, Maintenance Superintendent
T. Simpkin, Nuclear Licensing Administrator
G. Stojkovich, Regulatory Assurance Staff
J. Tiemann, System Engineering Primary Group Leader
D. Wozniak, Operations Manager
J. Zura, Nuclear Station Operator

U. S. Nuclear Regulatory Commission

J. Martin, Regional Administrator, RIII
T. Martin, Deputy Director, Division of Reactor Projects (DRP)
R. DeFayette, Enforcement and Investigation Coordination Staff (EICS)
B. Jorgensen, Chief, Section 1A, DRP
J. Smith, Senior Resident Inspector, Zion
P. Loughheed, Resident Inspector, Zion
M. Miller, Resident Inspector, Zion
P. Pelke, Enforcement Specialist, EICS
D. Wiedeman, Enforcement Specialist, EICS
J. Beale, Senior Enforcement Specialist, Office of Enforcement

NRC Attendees, continued

- * C. Shiraki, Project Manager, Nuclear Reactor Regulation
- N. Hilton, Reactor Engineer, Section 1A, DRP
- R. Bailey, Reactor Engineer, Division of Reactor Safety

* Participated via telephone

2. Enforcement Conference

An enforcement conference was held in the NRC Region III Office on May 11, 1994. This conference was conducted as a result of the findings of an inspection conducted March 24, 1994 through April 26, 1994, in which apparent violations of NRC regulations were identified. The inspection findings are documented in Inspection Report 295/304-94010, transmitted to the licensee by letter dated May 4, 1994.

The purpose of this conference was to discuss the apparent violations, their root causes, any contributing factors, and the licensee's corrective actions.

During the enforcement conference, the licensee acknowledged the violations. For each violation, the licensee's presentation covered the event investigation, including an event synopsis, the investigation the safety significance, and their corrective actions. A copy of the licensee's handout is attached to this report.

Attachment: As stated

Zion Enforcement Conference Agenda

Opening Remarks K.A. Strahm

Introduction R.P. Tuetken

Event Discussion E.A. Broccolo

Analyses/Corrective Actions

- event description
- event causes
- safety significance
- corrective actions

Aggregate Assessment of the Four Events

- broad-based corrective actions

Summary R.P. Tuetken

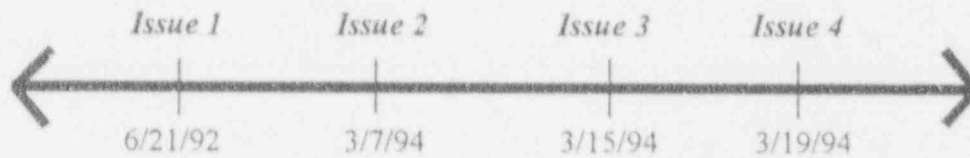
Closing Remarks K.A. Strahm

Attachment: Chronologies for Individual Events

Introduction

- Acknowledge Violations
 - Each violation was identified by CECO
- Event Causes have been identified
 - Each event was characterized by unique contributors
- Performed an aggregate assessment of the four events
- Summary of CECO actions to address the need for both event-specific and broad-based corrective actions
- Presentation will demonstrate that Zion has promptly and comprehensively responded to these events from both perspectives
- Need to improve ability to utilize low-level event information to assist in preventing the occurrence of more significant events
- Will discuss the following issues and the focus management is placing on them:
 - communications
 - overly complicated processes
 - critical path activities
 - accountability
 - ensuring/encouraging participation by all levels in assessing the need for and identification of appropriate corrective actions

Time Line



- Issue 1:* HIGH HEAD SAFETY INJECTION LOW FLOW
- Issue 2:* FAILURE TO TAKE ACTIONS REQUIRED BY TECHNICAL SPECIFICATIONS, WITHIN THE REQUIRED TIME PERIOD
- Issue 3:* ECCS VALVES FOUND WITH LIFTED LEADS (MOV-VC112D AND MOV-VC112E)
- Issue 4:* INADVERTENT CAPPING OF CONTAINMENT PRESSURE SENSING LINES

Event Discussion

Analyses and Corrective Actions

Issue 1: High Head Safety Injection Low Flow

Event Cause: Procedure Deficiency — flow verification was not required subsequent to installation of valve restraining devices

Safety Significance: The lowest total three loop flow (249 gpm) was 26 gpm less than the minimum acceptable flow of 275 gpm.

Nuclear Fuel Services (NFS) reviewed the deviation for impact on worst case accidents (small and large break LOCA).

The evaluation revealed no additional peak clad temperature penalties associated with the as found flow anomalies.

Safety significance of this event was minimal.

Corrective actions: Throttle valves were repositioned and stem measurements were made for future reference.

Injection flows were verified after restraints were installed.

All injection flow paths for both units were found to be acceptable.

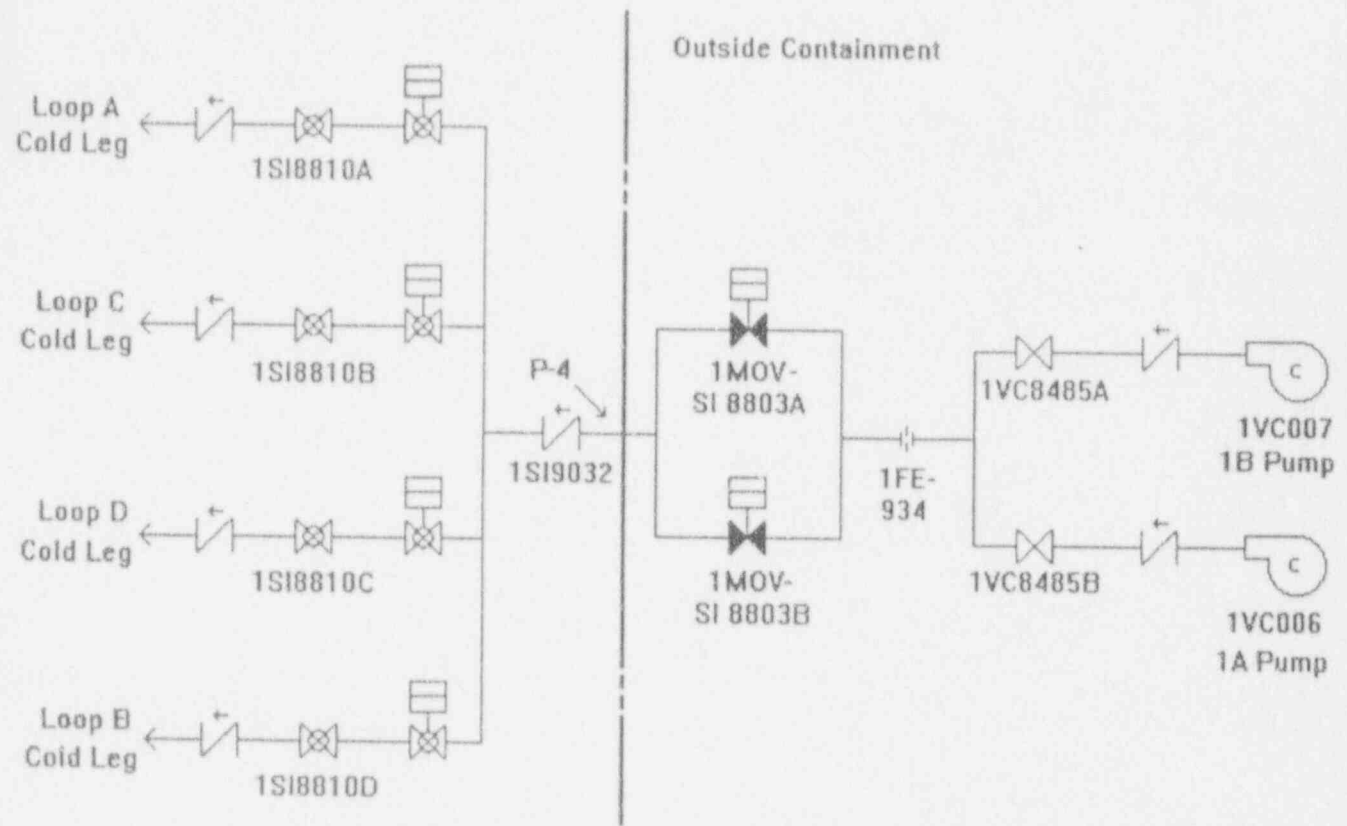
The Zion Independent Safety Engineering Group (ISEG) performed an independent evaluation that also concluded that the reduction in flow was the result of inadvertent changes to the throttle valve positions.

Zion's ISEG group is performing an independent review of how control of throttle valves are maintained in other systems.

A permanent procedure change to TSS 15.6.84 "Charging and Safety Injection Check Valve Test" will be made to ensure that flow measurements are verified following the installation of throttle valve restraints.

Zion's engineering organization will evaluate the appropriateness of this application for this valve design.

High Head Safety Injection Low Flow Rate



Issue 2: Failure to take actions required by Technical Specifications for two inoperable trains of auxiliary feedwater (AFW) within the required time period.

Event Causes: Human Performance Deficiency

- Operators failed to recognize that inoperability of the 2B Emergency Diesel Generator (EDG) in conjunction with the inoperable 2A AFW pump resulted in the 2C AFW pump being inoperable.

Procedural Deficiency

- Procedures did not direct operators to review the appropriate Technical Specifications

Additionally, Zion's custom Technical Specifications were confusing.

Safety Significance: The AFW system provides a reliable source of water to the steam generators for decay heat removal.

Either the turbine-driven AFW pump or one of the two motor-driven AFW pumps are capable of meeting the decay heat removal demands for the unit during accident conditions.

However, one available motor-driven AFW pump does not meet the accident analysis assuming one active failure coincident with a Loss of Offsite Power (LOOP).

The unit had not yet been taken critical following a refueling outage. Decay heat was minimal. All four steam generators were filled with water and available for cooldown to Residual Heat Removal (RHR) conditions. One motor-driven AFW pump capable of providing 100% of required flow was operable.

Safety significance of this event was minimal.

Corrective Actions: Repaired the 2A AFW pump.

Repaired the 2B EDG.

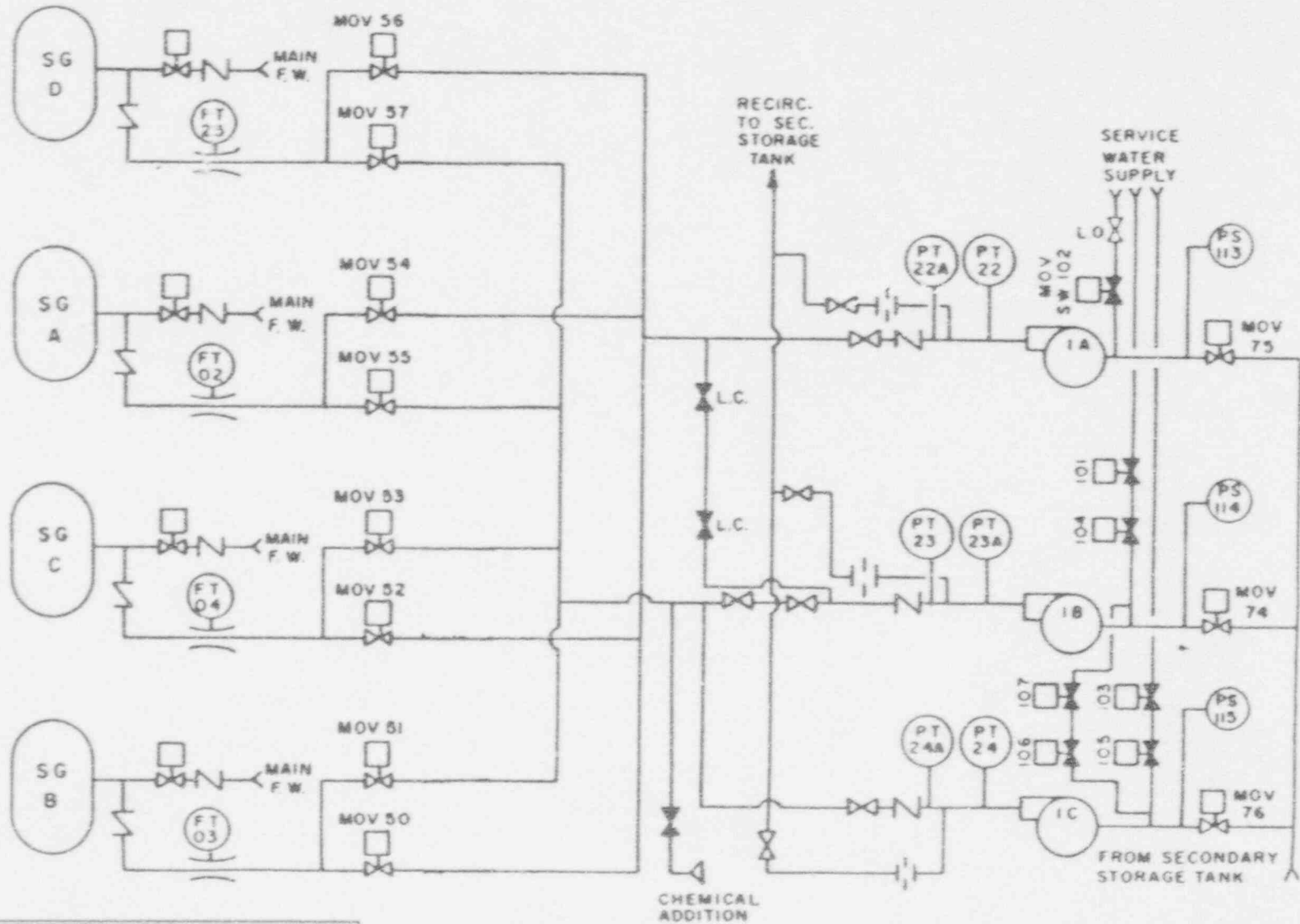
PT-14 "Inoperable Equipment Surveillance Tests", was revised to require a licensed shift supervisor review of Technical Specification 3.0.5, applicability and the Zion Operability Determination Manual (ZODM) for each PT-14 initiated.

Tailgated the event with all operating shifts.

Management conducted station-wide departmental meetings to heighten the level of awareness of all personnel.

Procedure changes will be trained and simulated in the current training cycle and will be incorporated into Continuing Training in September.

Zion's Technical Specifications Improvement Program currently in progress will alleviate confusion in this specification.



Failure to take actions required by Technical Specifications for two inoperable trains of auxiliary feedwater (AFW) within the required time period.

Issue 3: Emergency Core Cooling System (ECCS) valves found with lifted leads (1MOV-VC112D and VC112E)

Event Causes: Management Deficiency

- Cumbersome paperwork and processes led to improper signoffs.

Human Performance Deficiency

- Individuals reviewing paperwork failed to identify missing signatures.

Safety Significance: The leads that were lifted on 1MOV-VC112D & E disabled the automatic signal for the valves to open on either a low Volume Control Tank (VCT) level or a safeguards actuation.

Operation of these valves was always available to the operator from the main control board.

Nuclear Fuel Services performed an evaluation which demonstrated that the defeated interlocks represented minimal safety significance based on plant conditions (e.g. minimal decay heat, significant excess shutdown margin).

Corrective Actions: Physical verification performed of Motor Control Cubicle (MCC) wiring on 1MOV-VC112B, C, 2MOV-VC112B, C, D and E to ensure that these MOV's did not have lifted leads.

Zion Station Support Engineering developed a matrix for both units for all safety related MOV's that receive a safeguards actuation signal or perform an interlock function and experienced maintenance during the Dual Unit Outage. All of these MOV's were verified by testing or visual inspection.

Interim measures that were instituted to better control lifted leads include:

- increased management overview of lifted leads
- double verification of lifted leads
- Quality Control performing an independent verification of lifting and landing of leads

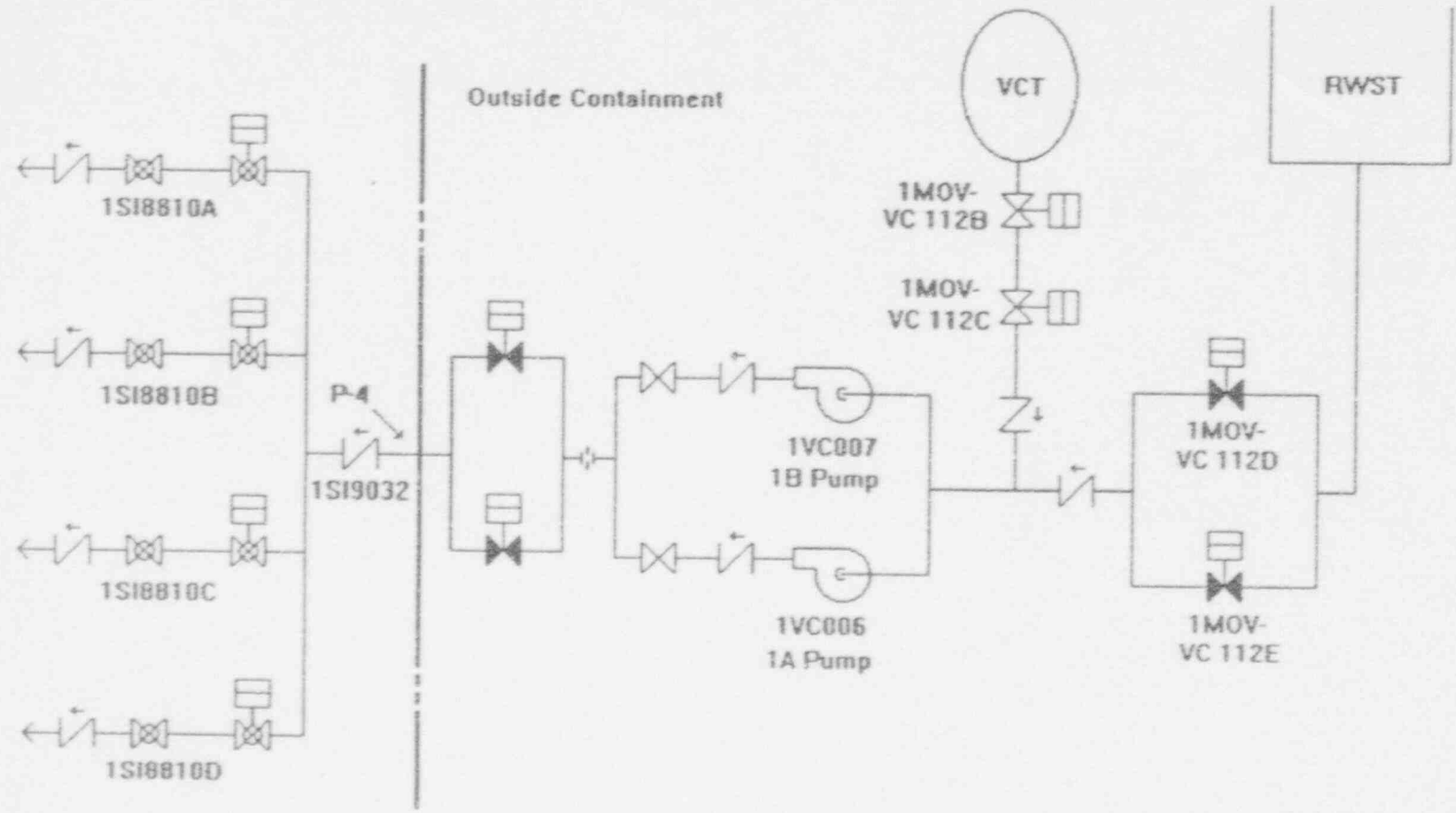
The Electrical Maintenance (EM) Supervisor and the Quality Control (QC) Inspector were counseled on the importance of attention to detail.

Event promptly reviewed during EM Department weekly meeting.

An investigation is being performed by an MOV Improvement Task Force based on testing, documentation and process problems identified during the Dual Unit Outage.

Standards for EM Department package documentation are being developed and communicated to EM personnel.

A review will be performed for other shops to determine if similar standard upgrades are necessary.



ECCS Valves found with lifted leads
(1MOV-VC112D and VC112E)

Issue 4: Inadvertent capping of containment pressure sensing lines

Event Causes: Management Deficiencies

- Containment penetrations inside containment were not labeled.
- Lack of supervisory follow-up.

Human Performance Deficiencies

- Inadequate communications between the work crew and supervisor regarding the extra lines being capped.
- The grid map identifying the penetrations was incorrectly read.

Safety Significance: Due to inoperable transmitters, the engineered safeguard features (ESF) automatic actuation functions based on the containment pressure signal were also inoperable. The affected ESF functions were:

- Safety Injection (SI) on a containment high pressure signal
- Containment Spray (CS) actuation, Phase B containment isolation and MSIV isolation on a containment high - high pressure signal

An evaluation was performed which demonstrated that the inoperable containment pressure transmitters had minimal safety significance based on the less limiting actual plant conditions (e.g. minimal core decay heat, lower containment temperature and significant excess shutdown margin) existing during the event.

Corrective Actions: Removed pipe caps from the Unit 1 containment pressure sensing lines.

Inspected Unit 2 containment pressure sensing lines.

Inspected both units and verified that appropriate lines were open.

Conducted interviews to determine the number and locations of the caps installed. Walkdowns were performed and no additional caps found incorrectly installed.

As an interim measure, restricted maintenance work activities in the Auxiliary Building and both containments to a formal work control process.

Discussed expectations with individuals involved in inadequate follow-up.

Management conducted station-wide departmental meetings to heighten the level of awareness of all personnel.

Corrective Actions: Tailgating event and Appendix A of Zion Administrative Procedure (ZAP) 400-01, "Station Material Condition Program" in the maintenance departments
(Continued)

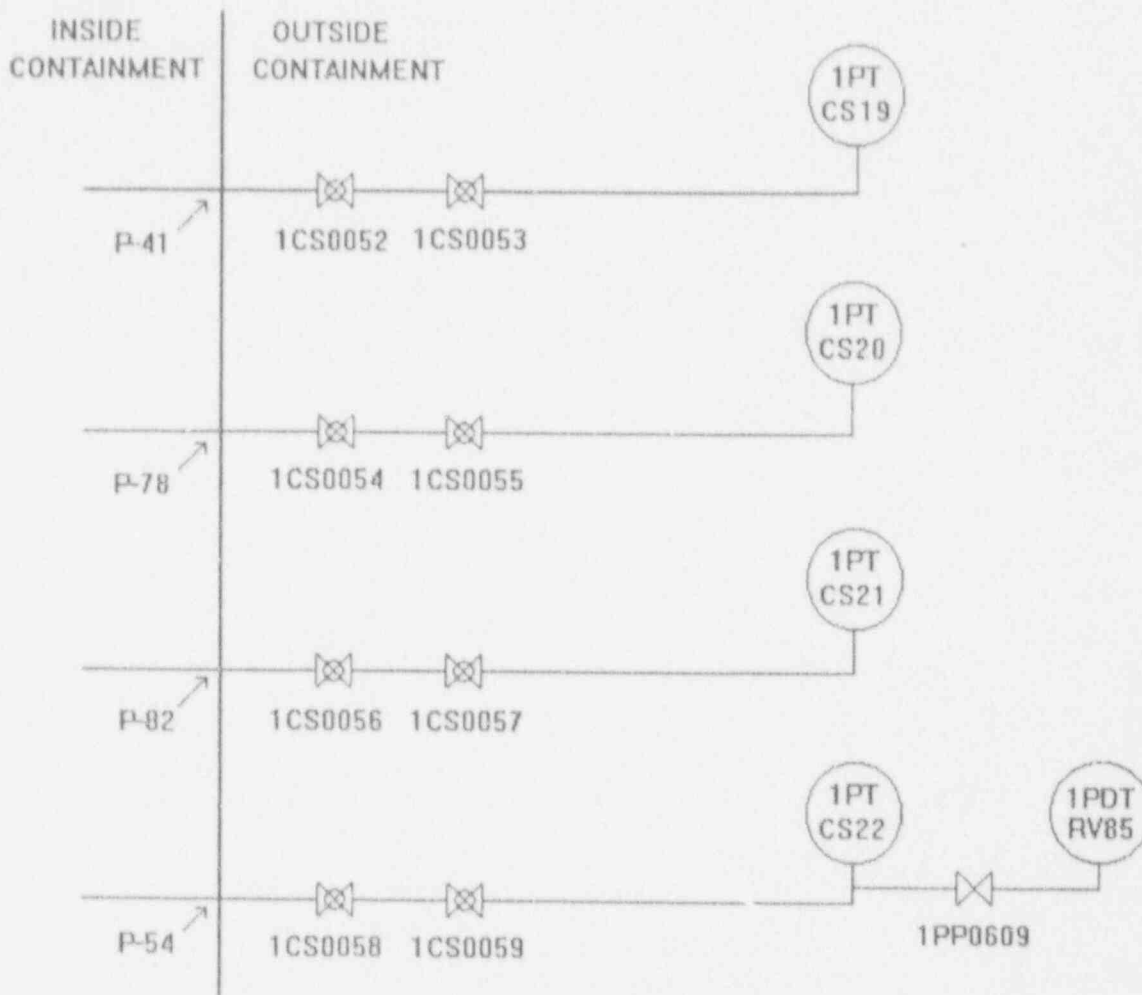
Reviewing options for labeling of penetrations inside Unit 1 and 2 containments.

Reviewing minor maintenance activities performed since the inception of the Minor Maintenance Crew to identify other activities which could potentially warrant the use of a Nuclear Work Request (NWR); no discrepancies identified to date.

Revising General Operating Procedure GOP-0, checklist E, "Containment Close Out", to verify penetrations or associated lines are open/uncapped before plant heatup. This procedure is performed by a Licensed Shift Supervisor.

Revising ZAP 400-01, "Station Material Condition Program" and 400-02, "Initiating and Processing a Work Request", to clarify and strengthen minor maintenance restrictions on plant changes.

Inadvertent Capping of All Four Containment Pressure Sensing Lines



Aggregate Assessment of the Four Events

Broad Based Corrective Actions

Program Deficiencies

Improvements in the Work Control Process

- Work Control Center
 - single point of contact for work authorization
 - all disciplines in one general area
 - smoother flow of work to the field
 - improved communication of work to the field
 - standardized work packages

- Electronic Work Control System
 - action requests utilized to ensure screening review by system engineer owning system
 - only work control center can generate a work request

- Operating Period Planning
 - look at required work activities for future quarters
 - allow better planning and resource utilization

Human Performance Deficiencies

Three basic elements to *Human Performance*:

- procedures
- training
- supervision

Corrective Actions to *Human Performance* problems typically focus on corrections to procedures or training

Improvements to Supervisory Processes include:

- increased focus on accountability
 - ❖ follow-up
 - ❖ commitment
 - ❖ communications
- increase use and understanding of self assessment
 - ❖ integrated reporting
 - ❖ monthly Integrated Quality Efforts (IQE) process
 - ❖ trending

Summary

- ☞ From a broad perspective management is focusing on:
 - ensuring effective communications
 - simplifying overly complicated/burdensome processes
 - addressing this common thread of critical path activity execution
 - emphasizing accountability
 - ensuring/encouraging participation by all levels in assessing the need for and identifying appropriate corrective actions
- ☞ Need to maintain a self-critical perspective to ensure that performance, culture, and processes continue to improve.
- ☞ Periodically reassess corrective actions to ensure they continue to be effective and make changes when appropriate.

Attachment: Chronologies for Individual Events

ISSUE 1: HIGH HEAD SAFETY INJECTION LOW FLOW

- 6/21/92 Following Technical Staff Special Procedure (TSSP) 139.92, "*Charging and Safety Injection: Check Valve Verification Test*" successful completion, valve restraints are welded in place.
- 2/19/94 1630 - TSSP ^{15.6.84} ~~439.92~~ was started.
- 1710 - The 1A charging pump was started per section 8.1 of the test.
- 1716 - Testing was suspended due to flow abnormalities. Valve positions were reviewed and found to be in accordance with the valve lineup.
- 2100 - The 1B charging pump was started per section 8.2 of the test.
- 2300 - Section 8.1 was restarted. Total injection flow measured at 1FI - 934 was 360 gpm.
- 2/19/94 Troubleshooting efforts were undertaken. Four theories were investigated including flow blockage, pump degradation, leakage, and throttle valve position.
- 2/20/94 Radiography results received.
- 1510 - Section 8.2 was initiated to collect pressure data.
- 1611 - The 1B charging pump was started and run for approximately 30 minutes. The pressure data was reviewed. Preparations were made to rebalance flow through the injection lines.
- 2/21/94 1735 - Repositioning of the HHSI branch line throttle valves began.
- 2/22/94 0700 - Test completed successfully. Injection flow was measured at 435 and 440 gpm for the 1B and 1A pumps respectively.

ISSUE 2: FAILURE TO TAKE ACTIONS REQUIRED BY TECHNICAL SPECIFICATIONS WITHIN THE REQUIRED TIME PERIOD

- 3/7/94 During Technical Staff Surveillance (TSS) 15.6.43, "*Endurance Testing of Diesel Generators During Refueling*", the 2A Auxiliary Feedwater (AFW) Pump tripped on overspeed.
- 0533 - The 2A AFW pump was declared inoperable and a periodic test (PT) 14 was initiated.
- 0618 - The 2B diesel generator began experiencing frequency swings and was manually tripped. The 2B DG was also declared inoperable and PT 14, "*Inoperable Equipment Surveillance Tests*" was initiated.
- 3/8/94 It was determined that technical specification limiting condition for operation 3.7.2. action E should have been entered at 0618 on March 7, 1994 due to Technical Specification 3.0.5 applicability for the redundant motor driven AFW pump inoperability.

ISSUE 3: ECCS VALVES FOUND WITH LIFTED LEADS (MOV-VC112D AND MOV-VC112E)

3/26/94 1245 - During Technical Staff Surveillance (TSS) 15.6.35, "Manual Actuation of the Safety Injection and Safe Shutdown Systems and Diesel Generator Loading Test", on train A, IMOV-VC112D (RWST to charging pump suction isolation valve) failed to open. This placed unit 1 on a 7 day LCO.

1820 - Surveillance PT 10-4, "Safeguards Actuation Miscellaneous", section 5.9 was performed to support troubleshooting of failures from TSS 15.6.35. No problems were identified.

2100 - TSS 15.6.35 was restarted for troubleshooting.

2200 - One of the engineers performing TSS 15.6.35 and an electrician found two wires that were lifted and taped in the MCC breaker cubicle for IMOV-VC112D.

2330 - The MCC breaker cubicle for IMOV-VC112E was inspected. The same two wires were found to be lifted and taped in this cubicle also. Because both IMOV-VC112D and IMOV-VC112E were both found to have their SI signal inoperable, this placed Unit 1 on a 48 hour clock to cold shutdown. Both of these valves were still able to be manually stroked from the control board switch.

3/27/94 0130 - The electricians relanded the two leads on IMOV-VC112D under work request Z37327. Surveillance PT 10-F, "Safeguards Actuation of SVAG Valves - MOV-SI8808A, B, C & D - MOV-SI8812A & B - MOV-RH8703 - MOV-SI8802 - MOV-SI8806", section 5.1 was performed again and IMOV-VC112D was opened and IMOV-VC112C was closed as designed. IMOV-VC112D was then declared operable. Because only VC112D had been declared operable, the Unit 1 clock was changed to a 7 day clock starting at 1245 on 3/6/94. The electricians then relanded the two leads on IMOV-VC112E under work request Z377331.

0200 - The electricians and the system engineers verified that there were no lifted leads in the MCC breaker cubicles for 2MOV-VC112B, 2MOV-VC112C, 2MOV-VC112D, or 2MOV-VC112E.

3/27/94 0215 - A four hour red phone call was made for an inoperable high head injection path for Unit 1.

1330 - A level 2 investigation was requested.

3/28/94 Level 2 investigation team formed.

ISSUE 4: INADVERTENT CAPPING OF CONTAINMENT PRESSURE SENSING LINES

3/19/94 Pipe caps were installed at penetrations P-41, P-54, P-78 and P-82. The unit was in cold shutdown, Mode 5 but transitioned into Mode 3 prior to discovery.

3/23/94 0022 - 0512 The Operating department attempted to vent containment several times to reduce pressure due to heatup of the reactor coolant system. But the indicated pressure on IPI-RV85 did not decrease as expected. The valve lineups were verified and the vent lines were drained in efforts to lower containment pressure. On the following shift, the venting problem persisted so operators expanded the troubleshooting efforts.

1445 - The containment pressure and vacuum reliefs were verified to be open.

1630 - The IPI-CS19 was reading approximately 1.5 psig with the redundant pressure channels showing no elevation in pressure. With IPI-RV85 and IPI-CS19 both indicating a high pressure, Operations dispatched a Shift Foreman to containment to investigate further.

The Shift Foreman found a newly installed pipe cap on the sensing line for IPI-CS19 at containment penetration P-41 and reported this finding to the Control Room.

The shift determined that this installation was improper and the cap was removed. Pressure indication on IPI-CS19 dropped in response to the now open penetration.

The Shift Foreman then inspected the other penetrations which support containment pressure indications. He found newly installed pipe caps on the other three sensing lines for Unit 1 containment pressure. These were also determined to be improper and were removed. Upon removing the cap from the line that supplied IPI-RV85, indicated pressure dropped.

1754 - A total of four caps were removed from instrument sensing lines (penetration numbers P-41, P-54, P-78 and P-82). These caps had rendered inoperable 8 containment pressure instruments.

1806 - An ENS red phone call was made to the NRC to report the inoperability of the containment pressure transmitters.